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Spatial distribution of *Megalancistrus barrae* (Steindachner 1910), and first record on the high stretch of São Francisco basin

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Abstract: *Megalancistrus barrae* is a species endemic to the São Francisco River basin that has not previously been recorded from the Upper São Francisco basin.The present work increases the known distribution of the species by reporting new collections from two different regions in the Upper São Francisco basin: one in the Pará River and the other in the São Francisco River, downstream Três Marias dam, Minas Gerais state. In addition, this study compiles distributional data on *Megalancistrus barrae* from museums.

Keywords: Loricariidae, Pará River, Conceição do Pará, Três Marias, Minas Gerais

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The family Loricariidae is widely distributed in Central and South America drainage basins (Reis et al. 2003) and it is divided into six subfamilies (Nelson 2006). Ancistrinae, which was recognized by Isbrücker (1980), cannot be considered as a natural group based on morphological (Armbruster 2004) and molecular data (Lujan et al. 2015), and it has been reclassified into tribe Ancistrini within Hypostominae (Armbruster 2004). Ancistrini is known as the most species-rich tribe within Loricariidae, as it is comprised of over 257 species (Eschmeyer and Fong 2015), and can been grouped into three clades, with the genus *Megalancistrus* included in the *Panaque* clade (Armbruster 2008). The genus *Megalancistrus* is closely related to *Acanthicus*, *Leporacanthicus* and *Pseudacanthicus*, forming a group that is distinguished from other Ancistrini by "having bodies covered by short, stout, and sharp odontodes" (Lujan et al. 2015). Two species of *Megalancistrus* are recognized: (i) *M. barrae,* endemic to São Francisco basin, and (ii) *M. parananus,* widespread through Paraná, Paraguay and Uruguay basins (Fisch-Muller 2003).

The São Francisco River originates as a tiny outlet stream at Serra da Canastra and flows 2,900 km until it meets the Atlantic Ocean. Its watershed drains an area of over 645,000 km², making it the third largest basin in Brazil (Kohler 2003).The basin flows through five Brazilian states, including Minas Gerais, which encompasses 36.8% of São Francisco basin area (Godinho and Godinho 2003).The basin is subdivided into four stretches: (i) Upper: from its origin to Pirapora County, MG; (ii) Upper-middle: from Pirapora CountytoRemanso County, BA; (iii) Lower-middle: from Remanso County to Paulo Afonso cascade; and (iv) Lower: from Paulo Afonso cascade to its mouth (Paiva 1982). One of the São Francisco River's major tributaries is the Pará River, which originates in the mountains of Entre Rios County, MG, and disembogues close to the Três Marias Reservoir. The Pará Basin comprises 1.9% of the total São Francisco River watershed (Pellegrin 2001).

The subject of this study, *Megalancistrus barrae* (Figure 1), is recorded herein for the first time from the High stretch of the São Francisco, where it has been caught both upstream and downstream of the Três Marias Dam. The new records (Museu de Ciências Naturais, PUC Minas, MCNIP 1232; Museu de História Natural, UFMG, MHN 2084, MHN 2085 and Museu de Zoologia, Unicamp, ZUEC-PIS 8125) were taken at two distinct sites. The first was on the main channel of Pará River, in Conceição do Pará County, MG (19°44′21″ S, 044°53′29″ W) (Figure 2). The specimens were caught on different days in the summer of 2014, using casting nets (under IEF permit: 0204050-1561-2013). Both specimens were collected from habitats with fast moving water running over bedrock substrate. Water quality varied over time, with mean transparency = 130cm (±40cm), mean temperature = 27°C (±0.3°C), conductivity = 97µS/cm (±22µS/cm) and dissolved oxygen = 6.65mg/l (±0.2 mg/l).

The second new locality was a commercial fishing area, approximately 10 km downstream of Três Marias Dam (18°08′04″ S, 045°14′03″ W), in Três Marias County, MG (Figure 2). *Megalancistrus barrae* specimens were caught in the main channel of São Francisco River at the end of

Figure 1. Live *Megalancistrus barrae* collected in the Pará River, Conceição do Pará county, MG (MCNIP 1232/SL = 27.0 cm).

2014, using casting nets in a section of the river flowing over bedrock. In this case physical and chemical water quality data were not collected. Table 1 shows species' morphometric parameters following the methodology of Rapp Py-Daniel and Zuanon (2005).

Museum records of *Megalancistrus barrae* at three other stretches were also examined. In the Upper-middle of São Francisco *M. barrae* has been recorded from Manga County, MG (MNRJ 13602) and Barra County, BA (NMW 48019 and NMW 48020), as well as from the Paracatu River (LBP 11313). In the Lower-middle, *M. barrae* has been recorded from Itaparica reservoir (MUZUSP 100806 and NUP 13969), on the border between the states of Bahia and Pernambuco. *Megalancistrus barrae* has also been recorded from the boundary between the lower and lower-middle São Francisco River at the tail water of the Paulo Afonso dam (MUZUSP 100805, MUZUSP 100807, NUP 13970, NUP 13972 and NUP 13881). In the lower section of the river, another record came from the town of Guararu, SE, downstream of Moxotó Dam (LBP 11271). For further information about *M. barrae* see Chamon (2011). The museum acronyms follow (Sabaj Pérez 2014).

The combination of new and old records now demonstrate that *M. barrae* is spread throughout all stretches of the São Francisco basin, but with a scattered distribution. It could be a natural pattern, with the establishment of populations where there is appropriate conditions of reproduction, feed and grow (i.e., swift water over bedrock). Otherwise, the lack of spatial information could be related with the absence of systematic fishing through the basin; however, some rivers that have been thoroughly sampled (e.g., the das Velhas River; Alves et al. 2008; Alves and Leal 2010; Alves and Pompeu 2010) and no *M. barrae* specimens were reported from them. An unnatural source of dispersion could not be discarded, since the species is sold in aquarium stores, one of the most important ways to spread species (Magalhães 2007). The range of *M. barrae* can be subdivided in five reaches separated currently by the following hydroelectric dams: Três Marias, Sobradinho, Itaparica, Paulo Afonso and Moxotó.

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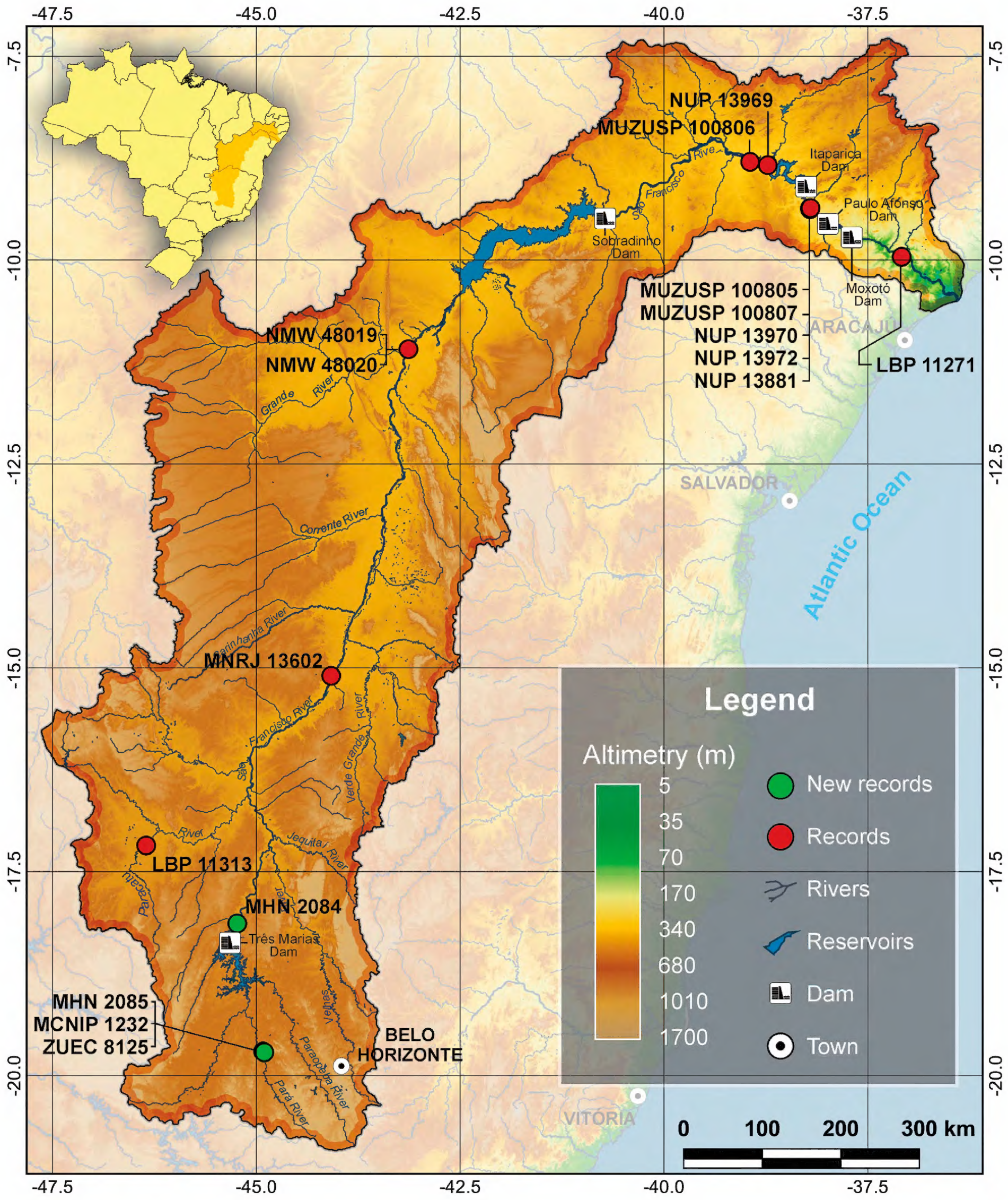

Figure 2. Map showing the known distribution of*Megalancistrus barrae* in the São Francisco basin. Inset map showing the location within Brazil of the São Francisco basin.

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Table 1. Counts and morphometric measurements to specimens of *M. barrae* (MCNIP 1232; MHN 2084 and ZUEC-PIS 8125) caught in the High stretch of São Francisco Basin (*n* = 7).

	Range			
	Min.	**Max.**	**Mean**	**SD**
Standard length (mm)	121	332	233.0	70.2
Percent of Standard Length				
Head length	31.2	34.8	32.7	1.3
Head depth	18.5	22.4	19.7	1.3
Head width	24.8	30.4	27.3	2.2
Body depth	20.9	24.2	22.1	1.2
Body width at dorsal fin	24.2	29.5	28.0	1.9
Body width at anal fin	13.2	16.4	14.6	1.1
Predorsal length	42.8	46.6	43.8	1.4
Postdorsal length	20.3	23.5	22.0	1.3
Postanal length	25.5	29.0	26.5	1.3
Dorsal-spine length	26.9	32.5	29.4	2.1
Pectoral-spine length	27.8	33.5	29.6	2.3
1st pelvic-ray length	24.0	28.4	26.0	1.4
Dorsal-base length	30.5	35.0	32.8	1.7
Percent of Head Length				
Snout length	61.0	67.7	64.9	2.4
Interorbital width	34.7	40.3	38.4	2.3
Orbital diameter	11.6	14.7	12.8	1.2
Dentary length	5.3	12.7	7.4	2.7
Interbranchial width	39.4	53.7	44.7	5.3
Caudal-peduncle depth	32.7	37.2	34.8	1.8
Counts				
Premaxillary teeth	4	8	5.9	1.3
Dentary teeth	5	10	7.3	1.5
Dorsal-fin rays	I+10	I+11	I+10	
Pectoral-fin rays	I+5	I+7	I+6	
Pelvic-fin rays	I+5	I+5	I+5	
Anal-fin rays	I+4	I+5	I+4	
Caudal-fin rays	I+13+I	I+16+I	I+14+I	
Lateral-line plates	26	26	26	0
Caudal-peduncle plates	5	5	5	0